

What is claimed is:

1. A method of compressing speech data, comprising:  
parsing an input waveform into pitch segments;

5 determining principal components of at least one pitch  
segment;

sending a subset of the determined principal components  
during an initial transmission period; and

10 sending coefficients of the input waveform for each pitch  
segment during a period subsequent to the initial transmission  
period.

2. The method of claim 1 wherein sending a subset of the  
principal components comprises sending six principal  
15 components.

3. The method of claim 1 wherein determining comprises:  
determining the number of pitch periods; and  
generating a correlation matrix.

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4. The method of claim 1 wherein determining comprises:  
ordering the principal components.

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5. The method of claim 1, further comprising:  
determining coefficients for each pitch period.

6. The method of claim 1, further comprising:  
determining if the principal components are still valid.

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7. The method of claim 6 wherein determining if the  
principal components are still valid comprises:

determining if a pitch segment exceeds a predetermined threshold.

8. The method of claim 7 wherein the predetermined threshold is a measure of a distance from a pitch segment to a centroid determined by the principal components.

9. The method of claim 7, further comprising:  
selecting a new set of principal components when the predetermined threshold is exceeded.

10. The method of claim 1, further comprising:  
reconstructing the input waveform.

15 11. The method of claim 10 wherein reconstructing comprises:

scaling the principal components by the coefficients for each pitch segment to form scaled components; and summing the scaled components.

20 12. The method of claim 10, wherein reconstructing further comprises:

concatenating reconstructed components of the input waveform; and

25 using a smoothing filter while concatenating the reconstructed components.

13. The method of claim 10 wherein the smoothing filter is an alpha blend filter.

30 14. The method of claim 1, further comprising:

reducing the principal components to reduce the number of bits transmitted.

15. The method of claim 1, further comprising:  
5 improving the accuracy of reconstructing the input wave  
form by increasing the number of principal components.

16. A method of receiving an input waveform, comprising:  
receiving a subset of determined principal components of  
10 at least one pitch segment during an initial transmission  
period; and

receiving coefficients of the input waveform for each  
pitch segment during a period subsequent to the initial  
transmission period.

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17. The method of claim 16 wherein reconstructing  
comprises:

scaling the principal components by the coefficients for  
each pitch segment to form scaled components; and  
20 summing the scaled components.

18. The method of claim 16, wherein reconstructing  
further comprises:

25 concatenating reconstructed components of the input  
waveform; and  
using a smoothing filter while concatenating the  
reconstructed components.

19. The method of claim 18 wherein the smoothing filter  
30 is an alpha blend filter.

20. A method of compressing speech data, comprising:  
parsing an input waveform into pitch segments;  
determining principal components of at least one pitch  
segment;

5 sending a subset of the determined principal components  
during an initial transmission period;

sending coefficients of the input waveform for each pitch  
segment during a period subsequent to the initial transmission  
period;

10 receiving a subset of determined principal components of  
at least one pitch segment during an initial transmission  
period; and

receiving coefficients of the input waveform for each  
pitch segment during a period subsequent to the initial  
15 transmission period.

21. An apparatus comprising:

a memory that stores executable instructions for  
compressing speech data; and

20 a processor that executes the instructions to:  
parse an input waveform into pitch segments;  
determine principal components of at least one pitch  
segment;

send a subset of the determined principal components  
25 during an initial transmission period; and

send coefficients of the input waveform for each  
pitch segment during a period subsequent to the initial  
transmission period.

22. The apparatus of claim 21 wherein to send a subset of the principal components comprises sending six principal components.

5 23. The apparatus of claim 21 wherein to determine comprises:

determining the number of pitch periods; and generating a correlation matrix.

10 24. The apparatus of claim 21 wherein to determine comprises:

ordering the principal components.

15 25. The apparatus of claim 21, further comprising instructions to:

determine coefficients for each pitch period.

26. The apparatus of claim 21, further comprising instructions to:

20 determine if the principal components are still valid.

27. The apparatus of claim 26 wherein the instructions to determine if the principal components are still valid comprises:

25 determining if a pitch segment exceeds a predetermined threshold.

28. The apparatus of claim 27 wherein the predetermined threshold is a measure of a distance from a pitch segment to a 30 centroid determined by the principal components.

29. The apparatus of claim 27, further comprising instructions to:

select a new set of principal components when the predetermined threshold is exceeded.

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30. The apparatus of claim 21, further comprising instructions to:

reconstruct the input waveform.

10 31. The apparatus of claim 30 wherein instructs to reconstruct comprises:

scaling the principal components by the coefficients for each pitch segment to form scaled components; and summing the scaled components.

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32. The apparatus of claim 30, wherein instructions to reconstruct comprises:

concatenating reconstructed components of the input waveform; and

20 using a smoothing filter while concatenating the reconstructed components.

33. An apparatus comprising:

25 a memory that stores executable instructions for receiving an input waveform; and

a processor that executes the instructions to:

receive a subset of determined principal components of at least one pitch segment during an initial transmission period; and

receive coefficients of the input waveform for each pitch segment during a period subsequent to the initial transmission period.

5 34. The apparatus of claim 33, wherein instructions to reconstruct comprises:

scaling the principal components by the coefficients for each pitch segment to form scaled components; and summing the scaled components.

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35. The apparatus of claim 33, wherein instructions to reconstruct comprises:

concatenating reconstructed components of the input waveform; and

15 using a smoothing filter while concatenating the reconstructed components.

36. An apparatus comprising:

a memory that stores executable instructions for compressing speech data; and

a processor that executes the instructions to:

parse an input waveform into pitch segments;

determine principal components of at least one pitch segment;

25 send a subset of the determined principal components during an initial transmission period;

send coefficients of the input waveform for each pitch segment during a period subsequent to the initial transmission period;

receive a subset of determined principal components of at least one pitch segment during an initial transmission period; and

5 receive coefficients of the input waveform for each pitch segment during a period subsequent to the initial transmission period.

37. An article comprising a machine-readable medium that stores executable instructions for compressing speech data, 10 the instructions causing a machine to:

parse an input waveform into pitch segments;

determine principal components of at least one pitch segment;

15 send a subset of the determined principal components during an initial transmission period; and

send coefficients of the input waveform for each pitch segment during a period subsequent to the initial transmission period.

20 38. The article of claim 37 wherein instructions causing a machine to send a subset of the principal components comprise instructions causing a machine to send six principal components.

25 39. The article of claim 37 wherein instructions causing a machine to determine comprise instructions causing a machine to:

determine the number of pitch periods; and  
generating a correlation matrix.

40. The article of claim 37 wherein instructions causing a machine to determine comprise instructions causing a machine to:

order the principal components.

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41. The article of claim 37, further comprising instructions causing a machine to:

determine coefficients for each pitch period.

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42. The article of claim 37, further comprising instructions causing a machine to:

determine if the principal components are still valid.

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43. The article of claim 42 wherein instructions causing a machine to determine if the principal components are still valid comprise instructions causing a machine to:

determine if a pitch segment exceeds a predetermined threshold.

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44. The article of claim 43 wherein the predetermined threshold is a measure of a distance from a pitch segment to a centroid determined by the principal components.

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45. The article of claim 43, further comprising instructions causing a machine to:

select a new set of principal components when the predetermined threshold is exceeded.

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46. The article of claim 37, further comprising instructions causing a machine to:

reconstructing the input waveform.

47. The article of claim 46 wherein instructions causing a machine to reconstruct comprise instructions causing a machine to:

5 scale the principal components by the coefficients for each pitch segment to form scaled components; and sum the scaled components.

48. The article of claim 46, wherein instructions causing a machine to reconstruct further comprise instructions causing a machine to:

concatenate reconstructed components of the input waveform; and

15 use a smoothing filter while concatenating the reconstructed components.

49. An article comprising a machine-readable medium that stores executable instructions for receiving an input waveform, the instructions causing a machine to:

20 receive a subset of determined principal components of at least one pitch segment during an initial transmission period; and

25 receive coefficients of the input waveform for each pitch segment during a period subsequent to the initial transmission period.

50. The article of claim 49, wherein instructions causing a machine to reconstruct comprise instructions causing a machine to:

30 scaling the principal components by the coefficients for each pitch segment to form scaled components; and

summing the scaled components.

51. The article of claim 49, wherein instructions causing a machine to reconstruct comprise instructions causing a machine to:

concatenate reconstructed components of the input waveform; and

use a smoothing filter while concatenating the reconstructed components.

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52. An article comprising a machine-readable medium that stores executable instructions for compressing speech data, the instructions causing a machine to:

parse an input waveform into pitch segments;

15 determine principal components of at least one pitch segment;

send a subset of the determined principal components during an initial transmission period;

20 send coefficients of the input waveform for each pitch segment during a period subsequent to the initial transmission period;

receive a subset of determined principal components of at least one pitch segment during an initial transmission period; and

25 receive coefficients of the input waveform for each pitch segment during a period subsequent to the initial transmission period.

53. The method of claim 1, further comprising:

30 comparing principal components to a library of principal components previously spoken by a speaker.

54. The method of claim 53, further comprising:  
generating phonemes; and  
converting the phonemes to text.

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55. The method of claim 1, further comprising:  
receiving a phoneme; and  
combining the coefficients and the principal components  
with the phoneme to produce natural speech.

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56. The method of claim 55, further comprising;  
altering the coefficients to reflect user selectable  
intonations.

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57. The method of claim 16, further comprising:  
comparing principal components to a library of principal  
components previously spoken by a speaker.

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58. The method of claim 57, further comprising:  
generating phonemes; and  
converting the phonemes to text.

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59. The method of claim 16, further comprising:  
receiving a phoneme; and  
combining the coefficients and the principal components  
with the phoneme to produce natural speech.

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60. The method of claim 59, further comprising;  
altering the coefficients to reflect user selectable  
intonations.